WAAS Technical Memorandum
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DR 84 Reduced Precision Approach GEO Ranging caused WAAS Coverage Loss GPS Week/Day: Week 1549 Day 4 (9/17/09)

Discussion:

On September 17th, a C&V source selection change and a CRE switchover caused reduced CONUS LPV200 coverage and Alaska LPV and LPV200 coverage.

On September 16, 2009, at 23:55 GMT, there was a C&V source selection change from ZTL to ZDC for the CRW geosynchronous satellite. This caused the CRW geosynchronous satellite to have an elevated UDRE from the beginning of the day on September 17th until 03:17 GMT. The elevated UDRE caused CRW to be usable only as a non-precision approach ranging source during this time.

The UDREs that were broadcast from the CRE geosynchronous satellite were different than the UDREs broadcast from the CRW geosynchronous satellite after a selected source change. The UDREs that were broadcast from the CRW geosynchronous satellite for PRN 135 were higher than the UDREs broadcast from the CRE geosynchronous satellite for PRN 135.

Figure 1 shows the UDREi plot for PRN 135 and PRN 138 broadcasted from the CRW geosynchronous satellite stream. Figure 2 shows the UDREi plot for PRN 135 and PRN 138 broadcasted from the CRE geosynchronous satellite stream.

Figure 1: UDREi broadcasted from CRW:

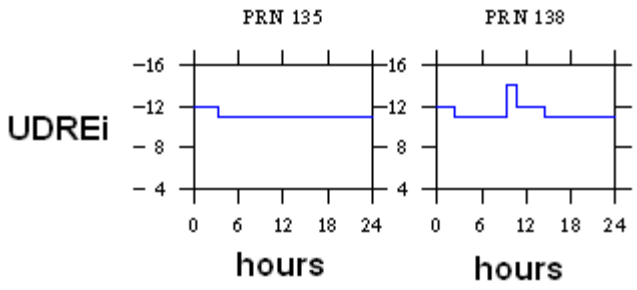
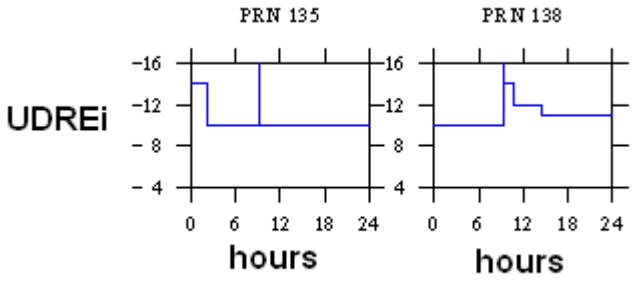


Figure 2: UDREi broadcasted from CRE:



Alaska coverage loss on September 17, 2009:

CRW was used as the source of corrections to evaluate the Alaska coverage area and presents a worst-case coverage analysis for the Alaska region.

After returning to precision approach ranging, the UDRE for CRW was 15 meters for the remainder of the day as broadcast from the CRW geosynchronous satellite. This elevated UDRE for PRN 135 played a large role in the loss of LPV200 coverage in Alaska. (See DR 88)

Table 1 shows the UDRE transitions of PRN 135 and PRN 138 as broadcast by CRW.

Table 1: UDRE changes of PRN 135 and 138 broadcast from CRW

GPS Time	GMT Time	Satellite PRN	UDRE Change	Ranging Mode Change
353588	02:13:08	138	12->11	NPA->PA
357476	03:17:56	135	12->11	NPA->PA
378986	09:16:26	138	11->14	PA->NM
383612	10:33:32	138	14->12	NM->NPA
398018	14:33:38	138	12->11	NPA->PA

The unavailability of CRW as a precision approach quality ranging source for over 3 hours, followed by the elevated UDRE broadcast from CRW after returning to precision approach ranging mode, and the the loss of CRE as a precision approach quality ranging source in Alaska for a significant part of the day, led to higher protection levels at several times during the day, which caused the drop in Alaska LPV200 and LPV coverage.

CONUS coverage loss on September 17, 2009:

At 09:16 GMT, there was a CRE switchover from Woodbine to Brewster. For the next 5 hours and 17 minutes following the switchover, CRE was usable only as a non-precision approach ranging source.

CONUS coverage was reduced at 100% availability in the southwest region due to CRE being unavailable for use as a precision approach ranging source. Substantial LPV200 loss in California was caused by PRN 138 being set to Not Monitored, though the coverage loss occurred at a different time than the southwestern region coverage loss. The LPV200 loss in California caused a large number of NOTAMs to be issued.

Figures 3 and 4 show LPV and LPV200 coverage respectively for September 17th.

Figure 3: LPV200 Coverage for September 17th

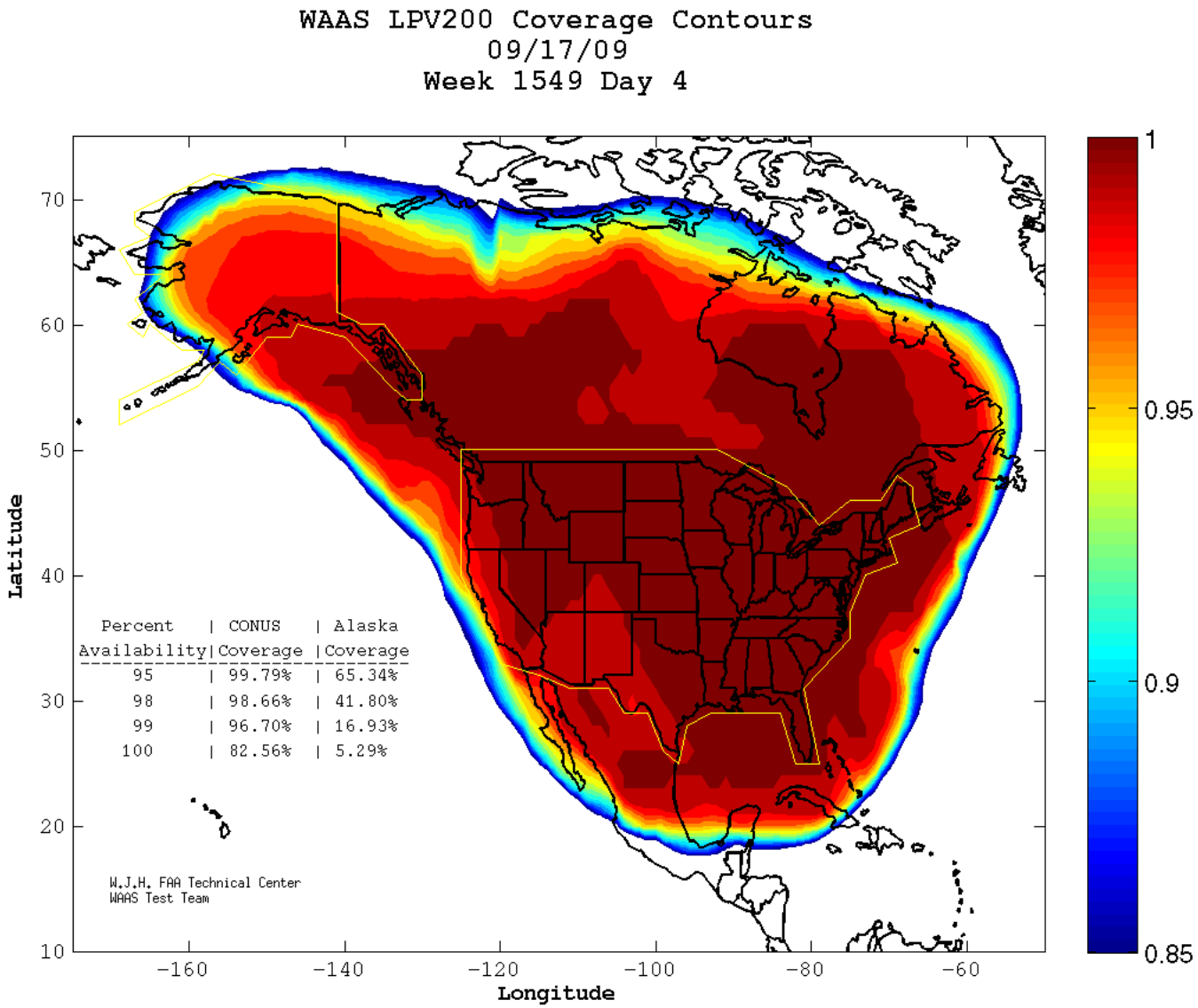
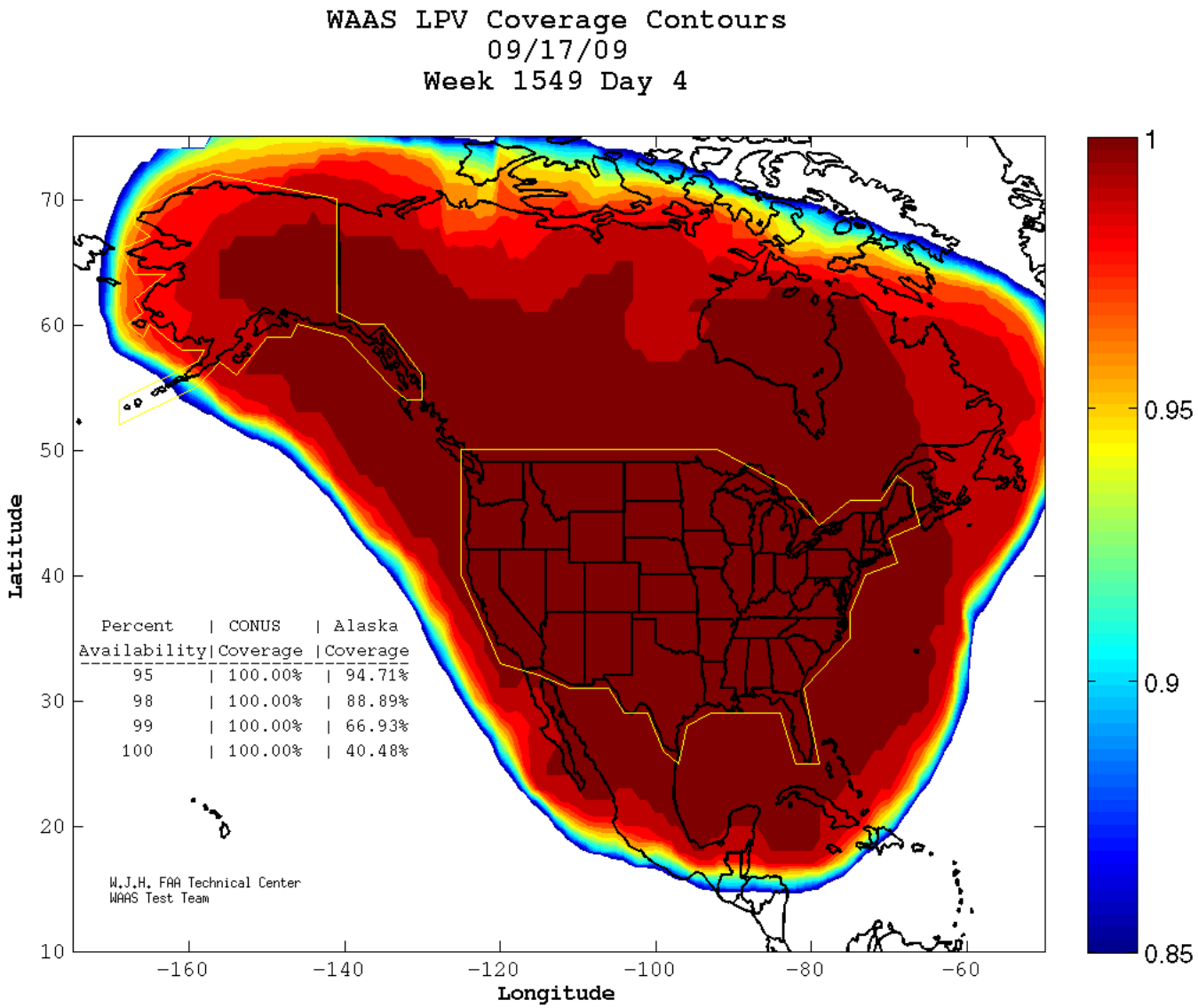


Figure 4: LPV Coverage for September 17th



Conclusion:

Two factors contributed to the loss of LPV and LPV200 coverage in Alaska and LPV200 coverage loss in southwestern CONUS and California. A C&V source selection change caused CRW and CRE to be unavailable as precision approach ranging sources for the first few hours of the day. A CRE GUS switchover at 09:16 GMT further reduced the availability of CRE as a precision approach ranging source. These two factors severely impacted LPV200 and LPV coverage.